

Appl. No : 10/060,842
Filed : January 29, 2002

REMARKS

With this Amendment, Claims 1-30 are pending in the present application, and Claims 20-30 are cancelled without prejudice.

Related Applications

Applicant would like to bring to the Examiner's attention co-pending US Patent Application No 10/200,472 (the '472 application), which is a continuation of the parent application of which the present application is a divisional. The '472 application is being examined by Examiner Andrew H. Lee in Art Unit 2877.

Restriction/Election

Applicant confirms the election of Claims 1-19, drawn to a field emission display device and identified by the Examiner as being a distinct invention from Claims 20-30 drawn to a method of making a field emission display device. Applicant has cancelled the non-elected claims without prejudice. Applicant reserves the right to pursue the cancelled claims in a divisional application at a later date.

No Obviousness under 35 U.S.C. § 103

Claims 1, 2, 6 and 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,137,212 to Liu in view of U.S. Patent No. 4,125,446 to Hartsough. Applicant traverses the rejection and respectfully disagrees with the Examiner's characterization of the cited references.

In the Office Action, the Examiner asserted that Hartsough teaches that nitrogen may be incorporated into an aluminum layer in order to decrease the hillock formation within the layer thereby increasing reflectivity and decreasing the resistivity. The Examiner also asserted, with reference to Column 4, lines 14-19 of Hartsough, that the aluminum layer incorporating nitrogen can be substantially hillock free.

Applicant respectfully submits, however that the above assertions are contrary to the disclosure of Hartsough. Applicant respectfully submits that Hartsough in fact, teaches exactly the opposite of what the Examiner suggests, and thus teaches away from the use of nitrogen to decrease hillock formation. Hartsough states at Column 3, lines 51-55, with reference to Figure 1, "For nitrogen, the data indicate that the specular reflectance decreased steadily from about 93% for a partial pressure of 10^{-7} Torr, to about 70% at 10^{-5} Torr, and to

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about 5% at 10^{-4} Torr,” and at column 3, lines 59-63 Hartsough states “The resistivity increased as the partial pressure [of the minor constituent gases] increased.” (emphasis added). Also at Column 4, lines 11-15 Hartsough states, “The resulting micrographs indicated that increased substrate temperature and increased partial pressure of the minor constituents were accompanied by increased size and a greatly increased number of hillocks.” (emphasis added). Thus, Hartsough actually discloses that specular reflectance decreases and hillock formation increases as the partial pressure (and thus the concentration) of nitrogen (one of the “minor constituent gases”) increases. While Hartsough might suggest that hillocks are undesirable in an aluminum film, this reference suggests that in order to achieve a reduction in the size and number of hillocks, one should reduce nitrogen concentration.

Therefore, in view of the disclosure of Hartsough, one of ordinary skill in the art desiring to produce an aluminum layer with minimized hillocks, with reduced resistivity or with increased reflectivity in a field emission display would seek to reduce or eliminate nitrogen, since Hartsough suggests that it is the increasing partial pressure of nitrogen which results in increased size and number of hillocks.

Thus, Applicant respectfully submits that the prior art of record contains no suggestion to modify the field emission display device of Liu in the manner suggested by the Examiner. In fact, the cited prior art teaches away from such a modification by suggesting that one should decrease nitrogen concentration in an aluminum film in order to increase reflectance and decrease resistivity.

Applicant submits that Claims 1, 2, 6 and 8 would not have been obvious to a person having ordinary skill in the art at the time the invention was made, and Applicant respectfully requests that the rejections be withdrawn.

Additionally, Applicant submits that dependent Claims 4, 5 and 7 include the unique combination of limitations of Claim 1 as well as additional combinations of limitations also not taught or suggested by the prior art of record.

With respect to Claims 4 and 5, the Examiner asserted that the claimed atomic composition of nitrogen would have been obvious, since optimization of workable ranges is considered within the skill of the art.

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Applicant respectfully disagrees with the characterization of these limitations as being simply "optimum" ranges. Applicant submits that a rejection based on "optimum or workable ranges" is inappropriate where the prior art does not teach or suggest the desirability of the result achieved. As discussed in MPEP § 2144.05, "[a] particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation." In re Antonie, 559 F.2d 618, 195 U.S.P.Q. 6 (CCPA 1977). Thus, for a rejection to be made based on "optimum or workable ranges," the prior art must first identify the result which the variable achieves.

Applicant has described in at least one embodiment of the above-identified application, that hillocks can be substantially eliminated in an aluminum film within a field emission display device by supplying nitrogen during the formation of the film.

Applicant respectfully submits that Hartsough has not shown the variable 'nitrogen concentration' to have the result of reducing hillock formation, as achieved by the methods and devices disclosed in the preferred embodiments of the present application. Thus, without disclosing the desirability of introducing nitrogen to suppress hillocks, Hartsough cannot be used to reject claims on the basis that the parameters affecting this result are merely "optimum or workable" ranges that would be known to one of skill in the art. Applicant therefore respectfully submits that the additional limitations recited in Claims 4 and 5 would not have been obvious at the time the invention was made.

Claims 9-12 were also rejected as being unpatentable over Liu in view of Hartsough. As discussed above with respect to claims 1, 2, 6 and 8, Applicant respectfully submits that Hartsough teaches away from the combination suggested by the Examiner and thus an ordinarily skilled artisan would not be motivated to make the suggested combination. For at least this reason, Applicant submits that it would not have been obvious to provide the field emission cathodes as recited in Claims 9-12, and Applicant respectfully requests that the rejections be withdrawn.

Allowable Subject Matter

Applicant notes with appreciation the Examiner's indication that Claims 3 and 13-19 would be allowable if rewritten in independent form including all of the limitations of the

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base claim and any intervening claim. As indicated above, Applicant believes that the independent Claims 1 and 9 are in condition for allowance. Thus, Applicant has not re-written claims 3 and 13-19 at this time.

With respect to Claim 3, Applicant notes that Claim 3 recites, "a layer of grid silicon between the insulating layer and the conductive layer," and not, "a layer of grid silicon between the dielectric layer and the gate layer," as suggested in the Office Action.

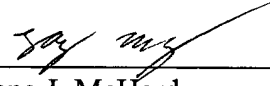
CONCLUSIONS

In view of the foregoing amendments and remarks, Applicant submits that the application filed herewith is in condition for allowance and such action is respectfully requested. If any undeveloped issues remain or if the Examiner wishes to discuss any issues further, the Examiner is respectfully requested to call Applicant's representatives at the number indicated below in order to resolve such issues promptly.

Respectfully submitted,

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Dated: 8/28/03

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